

AMENDMENTS TO THE SPECIFICATION

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In order to overcome such defects, it is more advantageous that a three-dimensional image is acquired by using a two-dimensional sensor array. However, since the number of ultrasonic detecting elements included in the two-dimensional sensor array becomes exceedingly larger than that in the one-dimensional array, new problems will arise. For example, when using a two-dimensional sensor array having an order of 80×80 elements, it is ideal that all of the elements are used for receiving ultrasonic waves. However, a problem such that wiring becomes more complicated with the larger number of elements ~~raises arises~~ in the manufacture of the two-dimensional sensor array. In addition, since there is a requirement for as many channels of in the electrical circuit for processing the detection signals, which are obtained by detecting ultrasonic waves by using the ultrasonic detecting elements, are required as many as the there are ultrasonic detecting elements, a problem that the electrical circuit becomes unduly complicated also raises.

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Under the circumstances, in order to reduce the number of channels of the electrical circuit for processing the detection signals, a “sparse array” approach is used, ~~in which~~ In such approach, only partial a part of the ultrasonic elements, which are included in the plural ultrasonic detecting elements arranged in a two-dimensional manner, are used.

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~~By the way~~ Moreover, in the case where a transducer array including having plural ultrasonic transducers is manufactured, the respective ultrasonic transducers are subjected to an inspection as to whether or not they operate with a predetermined performance, or not, and if If there is only one transducer out of the specifications, that entire transducer array is treated as a defective product. Especially, in For the two-dimensional transducer array, where the number of ultrasonic transducers are larger in number is large and smaller in the size is smaller than those in the one-dimensional transducer array, thereby the rate of occurrence of the defective products becomes is increased.

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In the case where an ultrasonic probe is manufactured by using the above described sparse array approaches, a the number of ultrasonic transducers to be used is smaller than in the case where of using all of the transducers inside of the aperture of the ultrasonic probe, and are used. therefore Therefore, the rate of occurrence of the a defective products can becomes lower due to the smaller number. However, even if there is only one ultrasonic transducer that is out of the specifications among all of the ultrasonic transducers that are to be used in accordance with the design of the sparse array, the transducer array is still treated as a defective product, thereby Thus the yield in the manufacture of transducer arrays becomes continue to be lower.

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The present invention has been achieved by considering the above-described circumstances. A first object of the present invention is to provide an ultrasonic probe in which even a transducer array, even one including ultrasonic transducers that are out of its an original specifications, can be used in a range where image quality is unaffected, and by which the yield in the manufacture of transducer arrays can be improved. Further, a second object of the present invention is to provide an ultrasonic transmitting and receiving apparatus using such an ultrasonic probe.

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In order to solve the above described problems, an ultrasonic probe D according to one aspect of the present invention B is an ultrasonic probe to be used when connected to an external apparatus main body, and comprises: a transducer array including plural ultrasonic transducers; connecting means used for connecting ultrasonic transducers selected from among the plural ultrasonic transducers to the external apparatus main body; and identification information holding means for holding identification information on the ultrasonic probe which information is associated with arrangement information and/or characteristic information on the selected ultrasonic transducers within the transducer array.

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In the examples shown in Figs. 7A to 7C, since the ultrasonic transducer A satisfy satisfies the expression (1), it is a conforming product, while, since the ultrasonic transducer B does not satisfy the expression (1), it is a defective product. In regard to the ultrasonic transducer that is judged as a conforming product, the waveform of the detection signal is converted into a frequency component by using Fast Fourier Transformation (FFT). Further, the peak difference $(V_R)_{pp}$ of the top and bottom of the waveform of the detection signal and a form of the spectrum of the detection signal are recorded.